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Research
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Client/Server Operating Systems—
The Critical Software Battleground

Facts and Paradoxes about Systems Software

There are two important facts about systems software:

1. Users consistently rank ease-of-use as the most important attribute.

2. Once users become familiar with a particular toolset, they are extremely reluctant to change.

There are paradoxes associated with these facts. As operating systems are enhanced with features designed to improve ease-of-use, they become more complex and difficult to use. On the other hand, the reluctance to change applies, regardless of the complexity or quality of the particular user's toolset, provided that the toolset has enabled the effective implementation of the users' applications.

The implications of these two simple facts and their associated paradoxes help explain why there is so much confusion about client/server operating systems.

What is an Operating System?

The general objectives of operating systems are to:

- Maximize ease-of-use

- Maximize use of equipment (thereby increasing efficiency and reducing the cost-per-user of sharing resources)

- Provide for the effective development, testing, and introduction of new system functions without at the same time interfering with service

There are six important "abstract areas of implementation" that characterize operating systems. While these abstractions were originally developed for host operating systems, they apply equally well to networks of computer systems. They are:

- *Process* that refers to the concurrent execution of a program with other programs (tasks) and with system (or network) devices

- *Memory management* that refers to the effective use of real memory without undue burden on the programmer or user of the system (primarily through the use of virtual memory concepts)

- *Data protection and security* that refers to both unintentional contamination of data bases and intentional violations of privacy and security

- *Scheduling and resource management* that refers primarily to management of the queues that develop (especially in multiuser systems) while waiting for system (or network) devices and/or services

- *System (or network) structure (architecture)* that provides paradigms and levels of abstraction referring to everything from icons and windows, through virtual machines and C/S architectures

- *Administrative services* that provide information on how the operating system or network is functioning in order to facilitate performance monitoring and management, and capacity planning

Operating systems vary considerably in the quality and functionality of their implementations in these areas and in meeting the general objectives of operating systems. Also, it is sometimes difficult to discern any positive correlation between operating systems quality and success in the marketplace.

Current Client/Server Operating Systems

MS DOS is the standalone operating system of choice (or necessity) for over 100 million personal computer users. Yet it may not have met the general objectives of operating system nor reasonable standards in all of the abstract areas of implementation. It will not be easily replaced when these users become integrated as the "clients" in the C/S environment except probably by a Microsoft upgrade.

Apple Macintosh, with its graphical user interface (GUI), integrated hardware-software design, and loyal user base has seemingly met the general goals of operating systems in a single user environment. However, weaknesses in the operating system become apparent as Apple attempts to extend itself into the general business environment and the C/S world.

UNIX was developed to provide easy access to computer resources for workgroups and among networked computers, and because of its relative simplicity (compared to mainframe operating systems) it was easily portable to different hardware platforms. In order to accomplish easy access and portability, serious trade-offs were made especially in the areas of *data protection and security* and in *administrative services*. UNIX was a convenient and cheap operating system for RISC workstations, and it has been at the forefront of the push for "open systems" and C/S computing. Now, generic UNIX has given way to enhancements that destroy many of its advantages, and proprietary brands have effectively destroyed its claim of being a standard for C/S computing and open systems.

Novell's *NetWare* started as a relatively simple (and necessary) network operating system for LANs and continues to evolve as a C/S operating system that integrates the DOS and UNIX worlds and interconnects LANs. Novell has met challenges of both Microsoft (LAN Manager) and IBM (LAN Server) and still maintained between a 65% and 70% market share.

OS/400 and *OS/2 Extended Edition (OS/2 2.X)* were key elements of IBM's Systems Application Architecture (SAA) intended for C/S computing—or cooperative processing. Both were planned as tightly integrated hardware-software systems with built-in relational data base management facilities and communications capability—the two essential elements of C/S computing.

- *AS/400* - was arguably the most successful computer system introduction of all time. Its quality was exceptional, as demonstrated by

its Malcolm Baldrige award. OS/400 met all of the goals and objectives of operating systems and had unparalleled connectivity. It was so successful as a traditional, system host that IBM is only now attempting to position it as a server in today's more complex environment. Its commercial market penetration is such that it will remain as the primary challenge for competitive hardware-software vendors for years.

- *OS/2* - after a long history of development, has arrived as an "industrial strength" operating system of high quality for Intel-based personal computers in the C/S environment. It is a mistake to measure OS/2's success against an installed base of Microsoft standalone DOS Windows systems. Its success will be determined in the actual implementation of C/S computing, and that is just beginning.

Although it is still by far the world's largest systems software company, IBM does not have leadership in systems software acceptance in the small systems marketplace. It is no longer the world against IBM; the focus of the systems software war has shifted to Microsoft.

The World Against Microsoft

Microsoft's position is strong:

- Microsoft believes DOS Windows and its derivatives will be the operating system of choice for the great mass of personal computer users. It will continue to improve that system and extend it into new areas such as interactive TV.

- It has received a favorable ruling in the Apple lawsuit, and Windows has already forced Apple to become price competitive with Intel-based systems.

- Windows NT (see INPUT's Research Bulletin, *Microsoft—The IBM of the 1990s?*) is a key element in Microsoft's plan for C/S computing. It is directed towards RISC platforms as well as PCs, and Microsoft (or at least Bill Gates) is already referring to NT as an "improved UNIX". That is nearly enough to make the warring UNIX factions stop fighting among themselves.

- Having failed to wrest control of LAN-operating systems from Novell (NetWare), NT theoretically presents a more tightly integrated network operating system and a more serious threat than LAN Manager ever was to NetWare.

- Microsoft certainly "blindsided" OS/2 with Windows and NT. As far as the AS/400 (and OS/400) is concerned, Microsoft (Bill Gates) has offered the gratuitous advice that IBM should spinoff the whole line, thus effectively eliminating it as a competitor in the C/S market as envisioned by Microsoft. That's unlikely to happen!

The "$64 Billion" Question

There isn't any certainty that there will be anyone to make C/S computing work except users themselves. C/S disaster stories are already beginning to surface in the trade press. The problem is that user integrators are trying to build a systems application architecture from the bottom up, and this architecture must at least integrate the above-mentioned operating systems.

The $64 billion question is, will a leader (IBM, Microsoft, or someone else) emerge to simplify the C/S operating systems world by successfully establishing de facto standards? Or will the levels of complexity increase with the new operating environments projected for release in 1994?

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